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Democratic theory and citizen participation: democracy models in the evaluation of public participation in science and technology

Peter Biegelbauer and Janus Hansen

We argue that some of the controversies over the democratic merits of (participatory) technology assessment can be traced to conflicting assumptions about what constitutes a legitimate democratic procedure. We compare how two influential normative models of democracy – ‘representative’ and ‘direct’ – value public engagement processes according to different criteria. Criteria drawn from this analysis are used to compare a series of case studies on xenotransplantation policy-making. We show that the democratic merits of participatory technology assessments probably owe as much to the institutional context as to the precise evaluative criteria or procedural designs. This calls for a closer interaction between science and technology studies research on public engagement and comparative politics scholarship.

THE PURPOSE OF THIS PAPER is two-fold: first, to explicate how different normative models of democracy produce different expectations and standards of assessment for processes of citizen and stakeholder engagement, which is often not acknowledged or explicated in debates about how to democratise science and technology (S&T). Second, we will also show some empirical findings that suggest that the impacts of such procedures are

likely to depend as much on the institutional environment as on the precise procedural design.

In recent years public controversies over novel and/or risky technologies have motivated searches for and experiments with institutional and organisational innovations in S&T governance (Fischer, 1999; Liberatore and Funtowicz, 2003; Bucchi and Neresini, 2008; Dryzek, 2010: Chap. 8). One cluster of institutional innovations is discussed under the headings of technology assessment (TA) and participatory technology assessment (PTA), especially the latter, which claims to ‘democratise’ S&T governance through various forms of citizen and stakeholder participation (Durant, 1999; de Jong and Mentzel, 2001; Lengwiler, 2008). This claim is controversial, and the ability of TAs and PTAs to actually democratise techno-scientific developments can be contested on at least three levels. The first has to do with the ability of (usually nationally based) political institutions to steer what appears to some observers as autonomous (global) techno-scientific dynamics. The second is linked to the ability of PTA processes to actually have an impact on governance. The third is about the democratic merits of actual PTA processes themselves.

In this paper we focus on the relationship between the second and third issues, working backwards from

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the assessment of the democratic merits of PTAs to their impacts on policy-making. Our argument is motivated by an observation that there seems to be very little interaction between 'mainstream', comparative political science research on democratic institutions, on the one hand, and science and technology studies (STS) scholars' work on citizen participation in S&T governance on the other. We suggest that such an interaction could be mutually beneficial: STS scholars could potentially gain a more elaborate understanding of the political institutions PTA processes interact with, as well as how they vary across polities. Likewise, political scientists could potentially gain insights into some of the particular intricacies associated with participation in S&T governance. As an overlapping point of connection we rely on normative democratic theory, which is invoked by both scholarly communities.

By locating the analysis of PTA at the intersection of STS and comparative political science we therefore hope to lay the groundwork for an analytical framework, which can integrate the normative demands for a democratisation of S&T governance with empirically based understandings of the use of actual PTAs in contemporary democracies, as these questions are too often treated separately.

Our argument proceeds in two main steps, one conceptual and one empirical. We first compare how two different models of democracy (representative and direct) produce different standards by which to assess the democratic merits of PTAs. We then use criteria drawn from the two models to map the use of PTAs in a series of case studies on (different modes and 'degrees' of) public participation with the governance of xenotransplantation (XTP)¹ in selected European countries and Canada. Based on this, we discuss how theories of democracy can help to integrate the interests of STS scholars, which tend to focus on processes, with the institutional insights of comparative politics.

Confronting democratic theory with S&T governance

Although science is an increasingly embattled domain in modern society, the interplay between democratic forms of government and the use of science in contemporary societies plays only a marginal role in mainstream research on democratic institutions (Turner, 2003). Mainstream analyses of democracy tend to have a textbook-like image of science as a source of relatively uncontested knowledge and expertise. STS scholars, on the other hand, have a keen eye for the controversial, value-laden and politicised aspects of science. However, STS research usually pays less attention to the larger institutional context and dynamics of contemporary democracies (Goven, 2006). Instead, one often finds a somewhat romanticised perception of various kinds of public participation as a means to democratise S&T, for instance through PTA activities (Sclove, 1995). Likewise, STS scholars are aware that civic participation in S&T governance is more prevalent and institutionalised in some contexts than in others. However, few attempts have been made to link this observation more systematically to comparative research on the working of democratic institutions (see, however, Jasanoff, 2005; Hagendijk and Irwin, 2006).

This suggests that an interdisciplinary approach is necessary. We suggest that an element in such an interdisciplinary approach should concern the standards according to which the democratic merits of PTAs are assessed. Among STS scholars there is a preference for deliberative and participatory ideals of democracy, which often deliver the normative and analytical baseline when PTAs are evaluated (Weale, 2001; Reynolds and Szerszynski, 2006). However, empirical studies indicate that PTAs have difficulties in achieving measurable impacts on governance processes, thus not delivering on the promises of democratisation (Hansen, 2010; Bora, 2010). Comparative politics research, on the other hand, primarily relies on representative models of democracy, in which PTAs do not fit very well as they are often developed as supplements to representative politics. In order to facilitate a dialogue between the two traditions it is thus useful to schematise the different assumptions about democracy informing the respective research traditions.²

Models of democracy theory

It is customary to distinguish between three overall clusters in theories of democracy: elite theories, pluralist theories and theories of direct democracy, which (internal differences untold) comprise deliberative and participatory approaches (Held, 1996). Each of these suggests different roles for citizens' participation in the democratic process.

In the elite tradition democracy is basically conceived as struggles for power between narrow elites.

The role of ordinary citizens is limited to participation in regular elections, which ensure that governing elites can be ousted from power. Other than that, the citizenry is considered to be spectators of the political game. The elite tradition foresees that a strong role for expertise and technocracy is inevitable in complex societies, whether this is seen as deplorable as an iron cage of *Sachzwang* (Weber, 2002) or a positive movement towards a more rational society.

The pluralist tradition claims that policy-making in liberal democracies should be determined by a plurality of groups, which effectively mirrors the interests of society through the interplay of the different interest groups and organisations (Dahl, 1989). In addition to participating in elections, ordinary citizens are expected to participate by involving themselves in organisations that represent their interests in the political arena. Politics is thus essentially a bargaining process between representatives of different social interests. Different types of expertise can be mobilised to serve as a resource in such bargaining processes.

The elite and pluralist theories in combination form the conceptual basis of most empirical work in comparative politics. We refer to the two traditions together as theories of representative democracy. These theories have generally not devoted much attention to the use of science and expertise in contemporary society, although this is beginning to change (Brown, 2006). The understanding and control of scientific knowledge is seen as an instrumental resource, which can be struggled over, not something which in and of itself is political (Turner, 2003).

Theories of representative democracy have attracted criticism from proponents of direct democracy. This tradition claims that all aspects of social life (including S&T) are in some sense political and should be the object of democratic autonomy. Hence, this domain cannot be left to technocratic elites even if it is assumed that these can be held accountable to elected representatives of the public. Conceptions of direct democracy experienced a revival with the new social movements of the 1960s and 1970s, which were critical of existing representative democracies. These criticisms entailed ‘participatory’ and ‘deliberative’ currents, which have significantly influenced the debates about expanded public engagement in STS scholarship.

Proponents of participatory democracy theory criticise representative democracies for offering only very limited possibilities of participation to ordinary citizens, which leads to a depoliticised public with little influence over their own lives (Sclove, 1995). Consequently, democratic procedures should not be restricted to politics in its more narrow and legal sense, but should also be extended to other key institutions of society, including the domain of knowledge production and technological innovation.

Deliberative democracy stresses the quality of political debate as a means to develop viable solutions

to common problems (Dryzek, 2010). It attacks one of the central tenets of pluralist democracy theory, that democratic politics is primarily an expression of private views and interests. The main source of democratic legitimacy is not the fair weighing of the fixed preferences of the citizens, but the process of preference formation through public debate and deliberation. The focus is thus on the way in which different actors learn from each other through deliberation and arrive at solutions that are ideally, both substantially competent and normatively fair (Webler and Renn, 1995).

In the following we propose to boil down the finer details of the different stands of democratic theory to the dominant dividing line between representative and direct democratic concepts. Recent work in democratic theory has begun to question the distinction between representation and participation, claiming that representation *is* participation (Plotke, 1997; Urbinati and Warren, 2008). This perspective holds promises of a closer connection between STS research and comparative politics (Brown, 2006). However, until this manifests itself in empirical research, the distinction between representative and direct democratic models still offers valuable insights into the often polarised assessments of the democratic merits of PTAs. Some key aspects of the differences between the two competing models vis-a-vis the governance of S&T are shown in Table 1.

Explicating multiple democratic ideals in the evaluation of TAs and PTAs

At the institutional level most contemporary democracies are modelled on representative principles, but since the 1960s many democracies have begun to

Table 1. Comparison of representative and direct democracy models

	Representative democracy	Direct democracy
Role of citizens	Elect politicians Support organisations to represent their interests	Articulate and develop own interests Participate in all stages of political process
Role of civil service	Effective and efficient professionals	Facilitators of collective decision-making, co-learners
Role of experts/scientists	Producers of value-free knowledge offer cognitive support to particular causes	Support (self-) enlightenment of citizens by acting as co-learners
Role of politicians	Steers providing authority	Overseers meeting demands
Prime legitimization	Indirect: politicians are elected by citizens	Direct: through citizen participation at different stages of political process

experiment with ways to increase participation and deliberation (Abels and Bora, 2004: 19–33). PTA exercises are a case in point. Sponsors and practitioners of TA and PTA usually claim that both types of instruments should assist competent, democratic will-formation, and in the case of PTAs the procedures should be in some sense ‘democratic’ themselves. However, when paying closer attention to the debates about PTA procedures in practice, it appears that protagonists often have recourse (implicitly) to different understandings of what constitutes a proper democratic process. In the following, we explicate three central differences between the two models of democracy, which we often see articulated in discussion about how PTA processes ought to be organised to be ‘democratic’, as well as the type of criticisms these standards may induce. The differences relate to the following headings: ‘principles of inclusion’, ‘issue framing’ and ‘quality of decision-making’.

Principles of inclusion

In the representative tradition, an important aspect of democratic sovereignty relates to the equality of citizens: the interests of all citizens should be given equal weight in decision-making processes. It is therefore essential that those passing judgement on behalf of the citizenry are representative of the larger public. This usually leads to demands that participants in such procedures must be statistically representative of the general population. From this perspective, criticism is due when processes are captured by minority interests (Horlick-Jones *et al.*, 2007).

In the direct democratic tradition, the ideal of sovereignty places more emphasis on the ideal of self-governance: the possibility that those affected by decision-making will be able to take part in and influence decisions. The central criterion for public involvement is therefore whether all legitimate interests have been given the opportunity to articulate their concerns. In this perspective, criticism is due when particular voices are excluded, especially those of vulnerable, affected groups that may have difficulties mobilising collectively.

Issue framing

In the representative tradition it is considered essential that the citizenry is enabled to make informed decisions. Therefore, it is important that participants in PTAs are provided with adequate and unbiased information. This can be achieved either through institutionally ‘independent’ sources or a plurality of information sources. Criticism is due if information is incomplete or biased by actors serving their own interests.

The direct democratic tradition stresses that ‘information’ cannot be provided in a context-free fashion. Therefore, it is equally important that participants in deliberations are allowed and enabled to

frame questions according to their own problem horizons, rather than just acting as recipients of authorised knowledge claims. Criticism is due when debates are cast in narrow, technocratic frames, excluding broader issues of social concern.

Quality of decision-making

The representative tradition assumes that citizens have relatively stable, pre-defined interests. Politics is therefore an arena where different groups struggle to have their interests recognised. For this struggle to play out in a fair manner, it is essential that decisions are made in a transparent fashion and that the decision-makers can be held accountable for their decisions. Criticism is due when the basis on which decisions are made and who is accountable are not transparent (Rowe and Frewer, 2000).

In the direct democratic tradition, interests and preferences are not considered to be given in advance, rather they are shaped in deliberations. Therefore, the critical standard is not (only) whether the decision-making process is transparent and decision-makers can be held accountable, but whether decision-makers are genuinely open to arguments. Criticism is thus due when decisions are reached through bargaining and compromise in the absence of deliberative argumentation (Webler and Renn, 1995).

The differences between the two traditions and the questions they generate for PTAs are outlined in Table 2. While derived from theoretical models with different normative foci, the criteria need not be mutually exclusive in practice. However, the

Table 2. Two democratic traditions and criteria for assessing TA/PTAs

	Representative ideals/criteria for TA/PTA	Direct democratic ideals/criteria for TA/PTA
Principle of inclusion	<i>Equal weight to all citizens:</i> Are participants representative of citizenry in general?	<i>Inclusion of all affected (groups):</i> Are all legitimate interests given a voice?
Issue framing	<i>Adequate information provision:</i> Is information provided by independent sources or a plurality of sources?	<i>Framing by the participants:</i> Are those included enabled to query issues according to their own criteria of relevance?
Quality of decision-making process	<i>Accountability of decision makers:</i> Is it transparent how decisions are made and where complaints/dissatisfaction can be registered?	<i>Attention to arguments:</i> Is the process genuinely open-ended, and are decision-makers willing to give reasons and engage in argumentative processes?

organisation of PTAs is likely to entail trade-offs at all three dimensions. In order to examine this more closely, we have classified and compared data from cases on XTP policy-making according to the three pairs of criteria.

Empirical findings from XTP policy-making

The countries included in the CIT-PART-project arrived at XTP regulation in different ways. Whereas Austria had virtually no discussion on XTP, Canada, Denmark, Finland, Latvia, the Netherlands, Sweden and the UK all had various types of expert TAs, the UK engaged in a public communication process, whereas Canada, the Netherlands and Switzerland performed PTAs.

Table 3 summarises the cases, ordered according to the criteria discussed above, of which we shall interpret selected aspects below. The data presented below is derived from the CIT-PART-project country case reports and have been corroborated through personal communication with the responsible research teams.³

For Austria there are no entries because XTP was discussed exclusively in very narrow expert circles. Civil servants produced reports, which suggested that regulation of XTP was not necessary. This is rather typical of Austrian regulatory activities in S&T governance: decisions often come late, if ever, discussions are restricted to narrow policy elites (Biegelbauer, 2010; Griessler and Biegelbauer,

2011). In stark contrast, Canada featured public as well as parliamentary discussions, expert TAs and a PTA on XTP, the latter carried out in six regions. The question mark in ‘information provision’ and the ‘no/yes’ in ‘framing by participants’ is due to the fact that while ample and diverse information was provided to the PTA participants, XTP was already framed by the organisers as an organ shortage issue. Some non-governmental organisations (NGOs) insisted that XTP was not an organ shortage issue, but an issue of human organ donation (or a donor) shortage, which is a different perspective on the problem. However, the NGOs were not able to change the framing of the problem as discussed in the PTA. Nevertheless, the participants in the PTAs were able to influence the agenda of the PTA during the process itself. Canada adopted a restrictive policy, with a *de facto* prohibition of XTP (Einsiedel *et al.*, 2011).

In Denmark a small party instigated a parliamentary debate on XTP. Soon a TA including a meeting with international experts was carried out, followed by a parliamentary hearing, leading to a moratorium on XTP (Hansen, 2011). In Italy there was neither a PTA nor an expert TA on XTP. Nevertheless, two expert committees voiced opinions on the issue, which were not taken up by government and no policy was adopted. In Latvia a report was drawn up by a group of scientists. This was, however, a courtesy expertise and does not constitute an independent TA. Since Latvia has no XTP regulation it also had no effect on government.

Table 3. Governance of XTP in selected countries

	Austria	Canada	Denmark	Italy	Latvia	Netherlands	Sweden	Switzerland	UK
Inputs to policy-making	Civil servant reports	Expert TA, PTA, Parliamentary debate	Expert TA, Parliamentary debate	Expert committee reports	'Mock' expert committee, no policy	Expert TA, PTA, Parliamentary debate	Expert TA, Parliamentary debate	Expert TA, PTA, Parliamentary debate	Expert TA, public communication
Criteria drawn from representative democratic theory:									
Equal weight to all citizens	-	Yes	No	No	No	No	No	Yes	No
Adequate information provision	-	Yes?	Yes	No	No	Yes	Yes	Yes	Yes
Accountability of decision-makers	-	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes
Criteria drawn from direct democratic theory:									
Inclusion of all affected (groups)	-	Yes	No	No	No	Yes	Yes	Yes	No
Framing by participants	-	No/Yes	Yes	No	No	Yes	No	Yes	Yes
Attention to arguments	-	Yes?	Yes	No	No	No?	No	Yes	No

In the Netherlands parliamentary discussions took place, an expert TA, a PTA and public communication exercises were carried out. The decision of the responsible minister to stop XTP came before the PTA was concluded and the results were only relayed informally to the political system. Though procedurally problematic, there was a high degree of correspondence between the PTA and the policy adopted. The Netherlands banned XTP (Versteeg and Loeber, 2011). In Sweden there were discussions in their parliament on XTP. A committee on XTP was established, which carried out a TA on the basis of expert hearings, an opinion survey and a subsequent conference, which was open to the public. Sweden adopted a moratorium on clinical trials (Hansson and Lundin, 2011).

In Switzerland parliament debated the issue, an expert TA was carried out, as well as a PTA. Political decision-making and PTA were running in parallel and as in the Dutch case the decision to regulate XTP came before the report of the PTA was sent to parliament. However, the time lag was only a few days and the opinions of politicians and PTA participants were congruent, as in the Dutch case. In Switzerland XTP is permitted, if with requirements and prior authorisation (Griessler, 2011).

In the UK parliamentary discussions took place amidst intense and indeed fiercely led public debates. Moreover, several expert TAs were carried out, as a result of which an agency (UKXIRA) was founded with the aim of advising the health minister on matters relating to XTP. Subsequent public communication exercises were organised in a manner which allowed discussions among members of the public. However, there was no feedback to the decision-makers, so these exercises cannot be classified as PTAs. The entries in Table 3 concentrate on the expert TAs. In the UK clinical trials of XTP are permitted in principle (Brown and Beynon-Jones, 2011).

Discussion of the findings

The evaluation of the democratic merits of policy-making varies somewhat between the two models of democracy. In general, there are more affirmative answers on the criteria drawn from representative theory, indicating that either the democratic standards are somehow easier to meet and/or that policy advice in most countries is adapted to these principles, whereas the direct democracy criteria are more at odds with actual existing policy practices. In principle, representative theory has no problem with the reliance on experts and the exclusion of the broader public and stakeholders in the regulation of particular technologies as long as, in the end, the decisions remain in the hands of the elected politicians. The cases where parliaments have been involved are thus by definition representative. This throws a different light on the many negative answers in the first

criterion, 'equal weight to all citizens' on the issue of representativeness, as these are in principle acceptable when seen through the lens of representative democratic theory due to the final say of parliamentarians and ministers on XTP regulation. Moreover the focus of public discussions over the last decades on the third criterion, 'accountability of decision-makers', seems to have had an effect on the representative democracies in our sample. There is only one 'no' in this category⁴ making it together with the second criterion, on 'adequate information provision', the category with the most answers in the positive.

The first two criteria drawn from direct democratic theory, on 'inclusion of all affected (groups)' and 'framing by the participants', both draw four 'yes' and four 'no'. The governance processes of the three countries employing PTAs all were positive on these two criteria, with the exception of Canada in the case of 'framing' producing an unclear result symbolised by a 'yes/no'. The same is true for the third criterion based on direct democratic theory, on 'attention to arguments', where the three countries featuring PTAs produce positive or ambiguous results. As a counterfactual, the only country not employing PTA and featuring a 'yes' is Denmark, which has a rich tradition in public participation exercises in the governance of S&T and which also had a detailed and structured TA on the regulation of XTP, embedded in parliamentary debates.

When comparing the results of the different countries one can see that Switzerland and Canada score best on both sets of criteria, whereas Latvia and Italy show the lowest scores. The other countries are lined up in between, with the Netherlands being next, followed by Denmark, Sweden and the UK. The two sets of criteria are therefore not mutually exclusive, but rather seem to co-vary to a significant extent. This is perhaps not surprising, given that democracies have a systemic quality, a fact reflected in democracy indices, where countries feature consistently high or low scores over most criteria (Müller and Pickel, 2007; Campbell and Barth, 2009). We also observe that the PTA cases scored better both on criteria drawn from representative and direct democratic theory than the TAs and that countries with a history of public engagement exercises, Switzerland, Canada, Netherlands and Denmark, in general had higher scores than those without.

Nevertheless it is important to notice that all of the PTA cases reviewed here produced ambiguous results when it comes to the impact on policy-making. In Switzerland and in the Netherlands the delivery of PTA results was in a tight race with the parliamentary decision-making procedures that in the end was lost in both cases – which incidentally points to an issue frequently raised against PTAs, namely that they are time-consuming (Abels and Bora, 2004: 53; Montpetit, 2008). Moreover in both the Netherlands and Canada it is unclear how influential the PTA results were for actual XTP policy-making.

This observation has two aspects. First, the question about the actual impact of PTAs on decision-making presents a methodological challenge to empirical analysis,⁵ especially when adhering to the demanding criterion derived from direct democratic theory calling for the willingness of decision-makers to give reasons and engage in argumentative processes with open outcomes. Second, the unclear results of PTAs on the regulation of XTP may also be interpreted as part of a series of rather disappointing results of public participation exercises in the governance of S&T (Seifert, 2003; Abels and Bora, 2004; Reynolds and Szerszynski, 2006).

In the following section we will investigate why public participation exercises seemed to take root more strongly in some countries than in others.

The governance of S&T and democratic policy-making

As described above it seems to be difficult to make the processes and results of participatory policy advice compatible with representative political systems. The problem has already been identified (Joly and Assouline, 2001; Joss and Belucci, 2002; Bütschi *et al.*, 2004; Bora and Hausendorf, 2004).⁶ Yet the difficulties of creating some type of 'resonance' (Bütschi *et al.*, 2004) in the political systems of modern democracies persist. Our analysis shows that at least a part of this problem arises from differences in the normative foundations of PTA compared to existing representative institutions. This constitutes a dilemma for the proponents of PTAs. If such procedures are to deliver genuine alternatives to politics as usual, they need to distinguish themselves from other modes of policy advice. On the other hand, if they are too 'alternative', they risk being ignored.

The question of whether or not representative democratic political systems are able to deal with the challenge of integrating participatory practices of policy-making is still undecided. In principle representative democracies have shown that they can adapt to changes and over the last decades have reacted, amongst other things, to citizens disappointed by the welfare state, the strengthening of new forms of protest and participation influenced by social and technological developments and the rise of NGOs. This has been described as a change from 'government to governance'. Comparative political science studies have shown that some countries have followed that path further than others (Rhodes, 1997; Hajer and Wagenaar, 2003).

In the regulation of S&T we can observe that some countries have changed their ways of decision-making more than others. The historically contingent flexibility of political systems is important among the cases analysed in this paper. Austria, for instance, is a traditionally structurally conservative neo-corporatist⁷ case with tightly coupled

institutional structures allowing only for a limited input from outside the neo-corporatist policy communities in many policy fields. STS research indicates that in the governance of S&T there has been a persistent emphasis on experts and stakeholders in that country that still endures (Biegelbauer, 2010; Biegelbauer and Mayer, 2008). In the structurally less conservative Dutch case neo-corporatist institutions are relatively less privileged and are voices in the large chorus of societal interests trying to make themselves heard in policy-making (Karlhofer and Sickinger, 1999). Scientific experts and stakeholders still have a dominant position, but they have been critically supplemented with the public in the form of various public participation measures. In the structurally more dynamic case of the UK, decision-making on S&T has a two-tier structure: on the one hand there has been a real proliferation of public engagement exercises of various sorts during the first decade of the present century making an effort to complement decision-making, while on the other hand the older forms of policy-making processes in which experts play the key role still are dominant, if perhaps somewhat less visible (Brown and Beynon-Jones, 2011).

Those countries have been more susceptible to the new public engagement instruments, in which different factors come together. Of prime importance is a general openness of policy-making of the respective political system (compare also with Joly and Assouline (2001)). Equally important seems to be the absence of closely knit policy communities, such as these described by comparative political science for Austria and those of the British 'administrative villages' before the Thatcherite 'New Public Management' reforms kicked in (Peters and Pierre, 2001). Since many issues in the governance of S&T do not necessarily involve politicians, but stay in the realms of the civil service, it is important that the bureaucracy is not paternalistic, but heeds accountability, transparency and openness as important factors of democratic decision-making processes (as is the case for Canada).

All of these factors make policy-making more permeable and more susceptible to new ideas. This susceptibility goes hand-in-hand with a pluralist political culture, in which public debates are led openly and indeed often intensely when it comes to intractable value-laden policy problems. Indeed the countries featuring PTAs on XTP (Canada, the Netherlands and Switzerland), all feature societies with a tendency to have open(ed) political debates. In addition active mass media play an important role in creating public discussions, as for example in the UK. Finally there is also a recognizable 'memory effect' as countries that have already carried out PTAs are more likely to have them again. In most of these cases the dominance of experts in the governance of S&T is gradually reduced, thus further enhancing the chances that PTAs will become institutionalised.

The governance of S&T and democratic theory

In this paper we have combined insights from comparative political science and STS research to explore why some countries are more likely to integrate participatory practices in their policy-making on S&T issues than others. In doing so, we have demonstrated how democratic theory can help interpret some of the problems facing public participation exercises in achieving impacts on policy-making, as such procedures are rooted in partly incompatible understandings of what are appropriate modes of policy advice in contemporary democracies. We have pointed out that the dominant, representative theories of democracy are typically quiet on the use of science in contemporary societies or rely on an oversimplified notion of scientific knowledge production. This is unfortunate as techno-scientific developments are absolutely central to the dynamics of contemporary societies. As STS research has amply illustrated, S&T often creates controversial policy problems, which are value-laden, knowledge-intensive and indeed often intractable (Gottweis, 1998; Roberts, 2004; Prainsack *et al.*, 2008). This type of policy problems presents both cognitive and normative challenges for decision-makers. The social controversies generated by novel technologies point to insufficiencies in the ability of representative institutions to deal with an increasingly outspoken public. This situation is a challenge for democratic theories, which still needs to be tackled convincingly. An example from the regulation of XTP was the intense discussions between animal rights groups on the one side and researchers and governments on the other side about the legitimacy of experimentation with animals for XTP purposes. These debates were hotly contested in many countries and it was difficult to find common ground between both sides. Most governments tried to ignore animal welfare NGOs, which in the case of the UK led to a policy failure and to the end of XTP in that country.

Deliberative and participatory ideals are often presented as ways out of these conundrums by STS scholars. However, as our empirical cases indicate, policy advice based on such ideals has difficulties manifesting itself in actual political practices, even in the institutional context most inviting to it. For this reason, direct democratic theorists need to pay close attention to the type of empirical research performed by STS scholars (Thompson, 2008). STS scholars, on the other hand, should combine their own findings on PTAs with research insights from comparative political science on the variation of institutional environments and its significance for the development and adaptability of political systems. Such an interdisciplinary, comparative approach could potentially contribute to a better understanding of the factors which either facilitate or inhibit the use of participatory and deliberative processes within representative institutional settings.

Notes

1. Xenotransplantation (XTP, from the Greek xenos = foreign) is the transplantation of organs or cells between species, usually referring to transplantation from animals to human beings. The data for the case studies stem from the CIT-PART-project, in which the regulation of XTP in Austria, Canada, Denmark, Italy, Latvia, the Netherlands, Sweden, Switzerland and the UK, the European Commission, the OECD and the Holy See is compared. In the framework of this EU 7th Framework Programme-project (SSH-CT-2008-225327) active from 2009 to 2011 eight country teams analyse the impact of TAs and PTAs on policy-making targeting XTP in detailed case studies, employing interviews, document analysis, literature review and other instruments. For more information see Biegelbauer *et al.*, 2011 (see pages 583–588, this issue) and the project homepage <<http://www.cit-part.at>>.
2. This will inevitably paint a simplified picture. For instance, scholars in comparative politics have applied deliberative theory (Steiner *et al.*, 2004) and STS scholars have addressed the compatibility of PTA with representative institutions (Laird, 1993; Brown, 2006). However, we think the analytical clarity won in this case exceeds the costs of simplification.
3. We understand expert TAs as a scientific counselling tool, typically delivered through reports produced by scientific experts, with the aim of identifying the possible social, political, economic and ecological consequences of new technologies. PTAs are instruments taking on various forms (Abels and Bora, 2004), in our cases mainly public debates and internet discussions (the Netherlands), citizen juries (Canada) and a consensus conference (Switzerland), including experts and laypersons with the goal of reaching a reasoned political opinion on the introduction and regulation of a controversial new technology. The TAs and PTAs in our country cases were all state-sponsored, which is usually the case for most TAs and PTAs.
4. Although the Latvian case qualifies only as 'transparent' (all assessments and recommendations are publicly available) whereas the accountability issue is more questionable since, in practice, all regulatory activities are confined to a close network of scientists.
5. The results of a PTA (e.g. reports, books) and its outcomes (e.g. media reports, public debates) are easily assessed. But it is much more problematic to establish their combined effect on policy-making, since they are just a few among many factors which potentially influence decision-making processes (compare with Bütschi *et al.*, 2004; Biegelbauer *et al.*, 2010).
6. The synthesis is given in Biegelbauer *et al.* (2010).
7. Neo-corporatism denotes a specific set up of political practices in which employees', employers' organisations and the state interact regularly with each other, setting up standards and regulating policy fields (Schmitter and Grote, 1997).

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